

Remarks

This application has been carefully reviewed in light of the Office Action of September 20, 2001. Each of applicants' independent claims has been amended to specify that the recited catalyst is an MFI catalyst. Support for this subject matter is found in applicants' specification starting with the paragraph bridging pages 12 and 13 and in the various examples starting on page 24. Reference is also made to the Structure Commission of the International Zeolite Associate referred to on page 1 of applicants' specification. Attached is a copy of pages 5-13 and 89-93 of the "Atlas of Zeolite Structure Types" as published by the Structure Commission, which identifies ZSM-5 and silicalite (by reference to the Flanigen et al article found on page 93) as "MFI" structure types.

In response to the rejection of claim 20 as indefinite, this claim has been amended by deleting "around" in line 5 so that the claim now specifies "a molar ratio of at least 1." ✓

With respect to the objection to claims 28 and 31, applicants would respectfully submit that these claims are properly dependent from their parent claim 1 and 30, respectively. The recitation in the dependent claims "of at least 300" does not include silicon/aluminum ratios outside the range of 180-1000 as specified in the parent claims. In this regard, attention is respectfully invited to the fourth paragraph of § 112 that specifies that the dependent claim is to be construed to incorporate by reference all of the limitations of the parent claim. Attention is also respectfully invited to MPEP § 608.01 III (page 600-677), particularly the first and second paragraphs thereof. It is clear that the dependent claims do not include silicon/aluminum ratios outside the range of the parent claims, specifically, silicon/aluminum ratios in excess of 1000. Nevertheless, should the Examiner persist in this objection, applicants will amend claims 28 and 31 to specify a silicon/aluminum atomic ratio within the range of 300-1000.

The rejection of claim 1, 2, 9, 12-14, 16, and 28-32 under 35 U.S.C. §102(e) as anticipated by the patent to Carpency et al is respectfully traversed. Referring first to the independent claims, claim 1 specifies that the crystalline silicate is of the MFI type and further calls for silicon/aluminum atomic ratio of 180-100 and an inlet temperature of 500-600°C in conjunction with a space velocity of 10-30 hrs.⁻¹. Claim 1 further specifies that the feedstock and the effluent have substantially the same olefin content by weight with the effluent having a higher propylene content. The patent to Carpency fails to disclose this combination of parameters as set forth in independent claim 1. It further will be noted that Carpency fails to disclose the operation of a process in which the feedstock and the effluent have substantially the same olefin content. Independent claim 30 contains substantially the same limitations as claim 1 and adds the requirement that the crystalline silicate catalyst be selected from the group consisting of ZSM-5 and silicalite.

It is noted initially that the Office Action is in error in suggesting that Carpency discloses the use of a ZSM-5 zeolite having a silicon/aluminum atomic ratio of 1:1 to 1000:1. Carpency discloses a very broad silica/aluminum ratio with respect to the wide variety of catalysts disclosed in Carpency which, with the exception of ZSM-5, are not MFI silicates. Where ZSM-5 is to be employed, Carpency specifically states that the ZSM-5 as described in Patent No. 3,702,886 to Argauer is to be employed. Argauer states that the ZSM-5 disclosed there has a much lower silicon/aluminum ratio than the minimum ratio of 180 called for in applicants' claims. In fact, Argauer appears to disclose a maximum silica/alumina ratio of 100 (corresponding to a silicon/aluminum atomic ratio of 50) and in the various examples discloses even lower silicon/aluminum ratios of about 50 or less. Clearly, the only MFI-type silicate disclosed in Carpency has a silicon/aluminum ratio far below the 180-100 ratio called for in claims 1 and 30 or

the preferred range having a lower limit of 300 as specified in claims 28 and 31 or within the range of 300-500 as set forth in claims 29 and 32.

Further, the patent to Carpency fails to disclose passing the feedstock over the catalyst at a space velocity of 10-30 hrs.⁻¹ at an inlet temperature of 500-600°C. As indicated in the Office Action, Carpency discloses a very broad range of space velocity in conjunction with an inlet temperature ranging up to 750°C. The preferred temperature is said to be at 575-625°C, and the examples show that when operating at or near this temperature range, the space velocity should be relatively low. In fact, the various examples in Carpency show space velocities on the order of 1 hr.⁻¹ WHSV. This, of course, is far below applicants' space velocity (LHSV) of from 10-30 hrs.⁻¹. Further, it will be noted that Carpency fails to disclose an olefin partial pressure as set forth in claims 13 and 14, nor does Carpency disclose a maximum diene concentration in the feedstock of 0.1 wt.%. The comments in the Office Action on this issue are noted. However, it is to be recognized that Carpency actually discloses adding diolefins to a feedstock in an amount well in excess of 0.1 wt.%, ranging from 2 wt.% up to 50 wt.%. Further, applicants would respectfully disagree with the Examiner's comments that the reference shows that the process "can be" operated without dienes in the feedstock. There is no such disclosure in the reference. In any event, the issue is not what could be disclosed, but what is actually disclosed in the reference.

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The rejection of claims 1, 7-10, and 27-36 under 35 U.S.C. § 103 as unpatentable over Carpency is respectfully traversed. With respect to the comments found on pages 11 and 12 of the Office Action respecting the silicon to aluminum ranges specified in applicants' claims, attention is respectfully invited to the comments above with respect to the ZSM-5 actually disclosed in Carpency. Not only would it be unobvious in view of Carpency to employ as MFI crystalline silicate having the silicon/aluminum atomic ratio parameters called for in applicants' claims, but

also to modify the Carpency reference to meet these parameters would be directly contrary to the teachings of the reference. In regard to the comments made with respect to claim 27, it is noted that this claim requires the use of two hydrocarbon streams. There is simply nothing in the alternative teachings of Carpency that require only a single hydrocarbon stream to suggest a modification of the Carpency procedure as suggested in the Office Action. Applicants would respectfully submit that the issue is one of obviousness to one of ordinary skill in the art without a consideration of applicants' teachings and not what would be expected once the modification of the prior art reference is made. The issue of expected or unexpected results would come into play once a *prima facie* case of obviousness is established. Here, however, there is nothing in Carpency that would support any finding of a *prima facie* case of obviousness of applicants' claimed subject matter involving two feedstock streams. ✓

With respect to applicants' claims calling for the silicate catalyst to be silicalite, or more specifically monoclinic silicalite as set forth in claim 33, applicants would respectfully that there is absolutely nothing in the reference that would support the proposed modification of the reference process. Reference is again made to the patent to argue Argauer, which is identified in Carpency as disclosing the ZSM-5 catalyst to be employed in the Carpency procedure. Aside from the question of the silicon/aluminum atomic ratio which, following the teachings of Argauer would be much lower than that called for in applicants' claims, ZSM-5 and silicalite are distinctly different molecular sieves (see Patent No. 4,061,724 referenced on page 12 of applicants' specification), and the zeolite disclosed in Argauer is of orthorhombic symmetry. (5)

The rejection of claims 1, 2, 9, 10, 12, and 28-32 under 35 U.S.C. § 102 as anticipated by EP 109060 is respectfully traversed. As has been recognized throughout the prosecution of this case, EP '060 does not disclose the range of the silicon/aluminum atomic ratio of 180-1000 as called for

in independent claims 1 and 3. In fact, EP '060 not only fails to disclose this range, or the preferred range having a lower limit of 300 or of 300-500 as set forth in claims 28, 29, 31, and 32, but instead simply refers to a silicon/aluminum ratio of at least 175 with no upper limit, disclosing a catalyst in which no aluminum is present, *i.e.* a silicon/aluminum ratio of infinity. Thus, the teaching in EP '060 is that the silicon/aluminum atomic ratio is of no significance and, in fact, that it makes no difference whether or not aluminum is even present in the catalyst. Applicants would respectfully submit that the Examiner is in error in suggesting a very broad range anticipates a specific narrower range included within the broad range. Specifically, to the extent that the rejection, whether based under § 102 or § 103 as discussed below, relies upon the premise that the disclosure of very broad ranges encompassing narrow ranges amounts to a disclosure of such narrow ranges or renders the use of such ranges obvious, applicants would respectfully disagree. It is believed to be well established that the existence in the prior art of broad ranges which encompass narrow ranges presented in the claims does not establish lack of novelty or obviousness of such ranges. In this regard, attention is respectfully invited to *In re Russell*, 169 USPQ 426, CCPA (1971) wherein the court in reversing the rejection of the claims stated:

Essentially, appellant's contention is that the employment of the proportions recited in the claims unexpectedly yields clear compositions without the need for a filtration step. Appellant's position on the law is sound, for even though part of appellant's range of proportions, and all of his ingredients, are suggested by the broad teaching of Wei, if appellant can establish that his relatively narrow ranges yield unexpectedly superior results as against the broad Wei ranges as a whole, appellant will have established unobviousness of the claimed invention. See *In re Luvisi*, 51 CCPA 1063, 342 F.2d 102, 144 USPQ 646 (1965); *In re Neave*, 54 CCPA 999, 370 F.2d 961, 152 USPQ 274 (1967).

For a similar holding, reference is made to *In re Wymouth and Koury*, 182 USPQ 290, CCPA (1974). In this case, the claims on appeal were directed to a lamp having an arc tube containing halogen in mercury atoms present in a ratio of 0.08 to 0.75. The prior art reference disclosed a

similar device containing halogen and mercury atoms. The calculated ratio of halogen to mercury atoms inherently disclosed in the reference ranged from 0.0000001 to 1.3. Although the prior art range enveloped the narrower range claimed by appellant, the court reversed the rejection of the claims in view of the unexpectedly superior results achieved by operating within the claimed range.

In the present case, similarly as in the *Russell* and *Waymouth* decisions, applicants' invention involves the use of the catalyst having characteristics which are not taught by the prior art and which produce unexpectedly superior results which are not recognized by the prior art references. Accordingly, applicants respectfully submit that the invention is patentable over the prior art reference.

In addition to the requirement in claims 1 and 30 of a silicon/aluminum atomic ratio of 180 to 1,000, these claims require an inlet temperature of 500° to 600° C and a space velocity (LHSV) of 10 to 30 hrs⁻¹. Claims 13 and 14, rejected under § 103, further require an olefin partial pressure of from 0.1 to 2 bar. EPA '060 does not disclose or suggest this particular combination of parameters and instead discloses, in addition to the very broad range of the silicon/aluminum ratio, broad ranges of olefin partial pressure, space velocity, and temperature. Thus, EPA '060 specifies a temperature of 400° to 600° C, a space velocity of 5 to 200 hrs⁻¹, and a pressure of 1.5 to 7.5 atmospheres. The only qualification on space velocity appears to be a space velocity of less than 50 hrs⁻¹ if the pressure is atmospheric and greater than 50 hrs⁻¹ at a pressure of from 1.5 to 7.5 atmospheres. In fact, with the single exception of Example 36, the space velocity in EPA '060 is well below the 10 to 30 hrs⁻¹ range called for in applicants' claims or well above this range as in Examples 32-35. Example 36 of EP '060 does disclose a space velocity of 20 hrs⁻¹. However, Example 36 does not specify a silicon/aluminum atomic ratio within the range called for in applicants' claims, and the only inference that can be drawn from the reference disclosure is that

this ratio, like the ratio of the other examples of silicalite -1 disclosed in the reference, is well above the upper limit of 1,000 called for in the claim. In this respect, every example of silicalite -1, as described in EP '060 specifies that no aluminum is present.

Applicants would respectfully disagree with the Examiner's apparent position that the various examples in EP '060 disclose that the olefin contents of the feed and product are substantially the same by weight or within $\pm 15\%$ of each other as set forth in claim 10. Further, it is again noted that claim 10, by its dependency from claim 1, requires, in addition, the temperature range of 500°-600°C and the space velocity of 10 to 30 hrs.⁻¹. As noted above, with the exception of Example 36, all of the space velocities shown in the various examples of EP '060 are outside of the claimed range. As to relative olefin content of the feed and the effluent, there is no clear indication in the various examples that these values are within the $\pm 15\%$ specification. In some cases they are clearly outside of this range. For example, the products in Examples 16-23, which show high selectivity to BTX, clearly do not involve an effluent having an olefin content within 15% of the olefin content of the product stream. In other examples it is impossible to determine whether the claimed relationship between the feed stream and the effluent stream is met. Similarly, Examples 1-6 show a very high product in the effluent of C₅₊ compounds. It is not clear whether these are saturated or unsaturated, and thus again, a determination as to the relevant olefin content of the feedstock and effluent cannot be made. In any event, it will be recalled that whether or not these various examples involve an effluent and a feedstock having olefin contents within 15%, they clearly do not involve the space velocity requirements of parent claim 1. The sole example of EP '060, which does indicate a space velocity within applicants' claimed range, is Example 36, as noted above. Example 36 does not, however, disclose the relationship between the olefin content of the feed and the effluent $\pm 15\%$.

In fact, from what is disclosed in Example 36, the relative olefin content of the feed and effluent could well be far outside this range. In this respect, the olefin content of the feed in Example 36 is 100% normal butene whereas the identified olefin content of the effluent (propylene, ethylene, and isobutylene) is about 50%. About 4-5% of the effluent is identified as saturated gases, with the remainder being identified as C₅₊ liquids. Presumably, substantial portions of these liquids would be olefins resulting from butene oligomers which are unsaturated. However, if as much as even 30% of the C₅₊ liquids are saturated, it is clear that the olefin content of the effluent would not be within 15% of the olefin content of the feedstock.

As to the Examiner's alternative ground based upon inherency, applicants would respectfully note that the law is well settled that for an alleged inherent feature to result from a prior art teaching, it is necessary that this inherent feature necessarily flow from the teachings of the prior art. Thus, an alleged inherent feature must be a necessary result and not merely a possible result. This principle is stated in MPEP Section 2112:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. (Emphasis original)

Section 2112 reflects the general rule that for inherency to reside, it must be shown that the alleged inherency is necessarily present and not a mere possibility. Thus, as stated by the Board in *Ex parte Keith*, 154 USPQ 321 (Bd. of App. 1966), in reversing the Examiner's rejection based upon inherency:

There are other possible courses the reaction could follow . . .
Asserted inherency must be a necessary result and not merely a possible result.

As indicated in Section 2112, this principle was more recently followed by the Board in *Ex parte Levy*, 17 USPQ2d 1461 (Bd. of App. and Interf. 1990), where the Board reversed an inherency rejection, stating as follows:

In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the alleged inherent characteristic necessarily flows from the teachings of the prior art (citing cases). (emphasis original).

Here, this claimed subject matter clearly is not inherent in EP '060.

Applicants would further respectfully submit that the Examiner is in error in the assessment of the C₂-C₃ compounds in the effluent of the '060 patent as reflected by the following statement: "The examples indicate selectivity of C₄ saturated compounds of less than 5 wt.%. Therefore at least 95% of the C₂ and C₃ compounds present in the product must be olefins." However, the percentages expressed in claims 7 and 8 are with respect to the C₂ and C₃ compounds and not the entire product. Thus, the requirement in claim 8, for example, is that at least 95% of the C₂ and C₃ compounds present in effluent are present as C₂ and C₃ olefins. The various examples in the '060 patent either indicate directly or at least allow the possibility of a very much lower olefin content of the C₂ and C₃ compounds in the effluent. Thus, Examples 1-6, for example, show selectivity to ethylene and propylene ranging from about 24% in Example 6 to about 54% in Example 3. When the reported selectivity to saturated C₄ compounds are measured in terms of the olefin content in the effluent, it is evident that the substantially less than 95% of the C₂ and C₃ compounds are olefins. For example, based upon the C₂, C₃ olefin content of the effluent, the C₄ saturated compound content would range from about 14% in Example 3 ($6.85 \div (44.79 + 4.95)$) to about 20% in Example 6 ($4.77 \div (23.65 + .31)$). In the various other examples, the selectivity to saturated compounds of less than 4 carbon atoms is in some cases

much less, but these examples appear to show a wide variance between the olefin content of the effluent when compared with the olefin content of the feed because of the relatively high amounts of other compounds, such as the BTX content as described above.

The rejection of claims 1, 2, 7-10, and 12-14, and 27-36 under 35 U.S.C. § 103 as obvious over EP '060 is respectfully traversed. In addition to the patentability of claim 1 over EP '060, the additional reasons for patentability of claims 13 and 14 are discussed above. With respect to the feedstocks as recited in claim 27, 34, 35, and 36, applicants would respectfully disagree with the assertion made in the Office Action that obviousness is established because the claim feeds are chemically and physically similar to the feeds disclosed in EP '060. In fact, the feedstocks disclosed in EP '060 are distinctly different from those claimed. In the various examples as discussed above, in every case the feedstocks are pure olefins or olefins mixed with helium. The '060 patent does disclose the application of the process disclosed there to feedstocks involving a mixture of olefins with other components including substantial amounts of paraffins. However, here the '060 process appears to involve an initial oligomerization step to produce a mixture of higher molecular weight olefins with C₄₊ saturated compounds. Thus, the '060 reference when considered as a whole would appear to actually teach away from employing feedstocks such as those specified in applicants' claims 27, 34, 35, and 36.

The rejection of claims 16-20 as unpatentable over EP '060 in view of Cosyns et al is respectfully traversed. For reasons advanced below, applicants would respectfully submit that the teachings of EP '060 and Cosyns cannot be selectively combined in order to arrive at applicants' invention without a hindsight reconstruction of the prior art references made with the benefit of applicants' disclosure. Further, it is to be recognized that even if one of ordinary skill in the art were, after considering applicants' disclosure, to attempt to combine EP '060 and

Cosyns, the results clearly would not involve the selective hydrogenation of dienes in an olefin-rich stream to form at least one olefin and further to form a feedstock having a maximum diene concentration of 0.1 wt.%. In this respect, Cosyns does not disclose the selective hydrogenation of a feedstock even remotely similar to that involved in EP '060 or in applicants' process. The feedstock in Cosyns is not an olefin-rich stream as called for in claim 1, from which claim 16 depends, but instead is a feedstock containing high concentrations of aromatic compounds. The only analysis of the feedstock employed in Cosyns is disclosed in the first table appearing in column 4 of the reference. Here, we find that the feedstock is predominantly aromatic, followed by 16% dienes, 12% paraffins, and only 4% olefins. Applicants would respectfully submit that a bare similarity in feedstocks between two references would not, in itself, provide a basis for combining the prior art references, but here even that factor is clearly missing. Further, Cosyns does not disclose that the dienes are converted into mono-olefins, and it is clear that Cosyns does not suggest a maximum diene concentration of 0.1 wt.%. In fact, if the Cosyns procedure is somehow combined with EP '060, the various maleic anhydride index (MAI) values given in Cosyns confirm that the diene content for the resulting product would be much higher than the maximum diene content specified in applicants' claims. In this respect, the various examples in Cosyns disclose MAI values ranging from 2 to 8 for the product. Based upon an initial MAI value of 106 for the feedstock containing 16% dienes, it is evident that the diene content of the product may range from about 3 up to about 10 times applicants' maximum diene content of 0.1%.

The rejection of claim 24 as unpatentable over EP '060 in view of Cosyns further in view of Gajda et al is respectfully traversed. As in the case of the rejections discussed above, there is no basis, absent applicants' teachings, for the proposed combination of prior art teachings.

Further, it is respectfully submitted that the Examiner is in error in suggesting that Gajda et al discloses a pretreating step to produce the desired silicon/aluminum atomic ratio of the catalyst employed in applicants' invention. Gajda, in the first full paragraph of column 3, discloses increasing the silicon/aluminum ratio from 30 to about 200, corresponding to a silicon/aluminum atomic ratio of 100 which is, of course, well below the corresponding range called for in applicants' claims. Further, applicants' claim 24 requires the subsequent dealumination procedure to involve treating of the catalyst with a complexing agent for aluminum. As described in applicants' specification, the complexing agent forms a coordination complex with the aluminum to remove aluminum from the molecular sieve framework. In Gajda an ammonium salt is employed to remove non-framework aluminum ions. Thus, the Gajda procedure appears to involve the formation of a salt and not a coordination complex. In any event, as noted above, if Gajda were combined as suggested by the Office Action, the results would be a silicon/aluminum atomic ratio well below the minimum value specified in applicants' claims.

The rejection of claim 24 as unpatentable over EP '060 in view of Cosyns further in view of Kuehl is respectfully traversed. Again, this rejection presents a proposed combination of prior art teachings which is made possible only after a consideration of applicants' disclosure. Further, assuming the prior art references are combined, the results would still not establish obviousness of applicants' claim 24. Claim 24 requires the treatment with a complexing agent which is preceded by a heating of the catalyst in steam. The treating process in Kuehl specifically precludes the use of steam and requires that the treatment procedure be carried out at a pressure sufficient to maintain the treatment solution in the liquid phase. In this respect, Kuehl discloses in the aluminum extraction procedure described in columns 11 and 12 two different

extraction procedures both of which involve the use of a chelating agent such as ethylenediaminetetraacetic acid to remove aluminum ions which migrate out of the pores of the zeolite. This may be preceded with an extraction step employing a strong mineral acid. In both procedures, water and not steam is involved.

The rejection of claim 24 as unpatentable over Carpeny in view of Gajda is respectfully traversed. Here, the arguments made above with respect to the proposed combination of Gajda with EP '060 and Cosyns are fully applicable here. As noted previously, the patent to Gajda does not involve formation of a coordination complex. There is no basis, absent applicants' disclosure, for the proposed combination of references, and even if Gajda were combined with Carpeny, the resulting silicon/aluminum ratio would be much lower than that called for in applicants' claim.

As demonstrated by the foregoing remarks, it is respectfully submitted that the combinations of the various secondary references with the primary references cannot be made in a manner to arrive at applicants' invention even if it were appropriate to use applicants' teachings as a basis for combining the diverse teachings of the references. This, however, is not the appropriate standard to be applied in combining prior art teachings. The appropriate standard forbids using an applicant's own disclosure as a basis for assembling prior art teachings and requires a suggestion or motivation in the prior art as reflected in decisions in *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 221 USPQ 929 (Fed. Cir. 1984) and *Ex parte Giles* 228 USPQ 886 (PTO Bd. Of Appeal. And Int. 1985). As expressed by the Board in *Giles* at 688:

Only appellant's disclosure and not the prior art provides a motive for achieving the combination as claimed by the appellant. To imbue one of ordinary skill in the art with knowledge of the invention . . . when no prior art reference or references of record convey or suggests that knowledge is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

Attention is also respectfully invited to the Federal Circuit decision in *In re Fine*, 5 USPQ2d 1956 (Fed. Cir. 1988) wherein the Court stated at 1600:

It is essential that “the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art.” *Id.* One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. (Emphasis added)

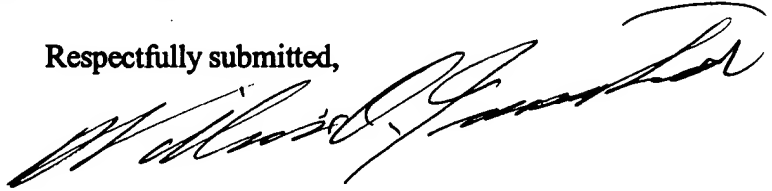
The admonitions in *Ex parte Giles* and *In re Fine* are to step back in time to evaluate the invention only in the context of what is disclosed in the references without regard to what is disclosed in appellants’ specification. When this is done, it is believed clear that one of ordinary skill in the art would not arrive at appellants’ invention based only upon the references and “the then-accepted wisdom in the art.”

For the reasons advanced above, it is respectfully submitted that this application is in condition for allowance, subject only to the possibility of a double-patenting rejection should an issue presented by the provisional double-patenting rejections come into being. As indicated previously, a terminal disclaimer will be filed when timely and appropriate.

Enclosed in a check in the amount of \$110.00 to cover the fee for a one-month extension. A response was due December 21, 2001, to the September 21, 2001, Office Action, but with the payment of the one-month extension fee, the period for response is extended to Monday,

January 21, 2001, a Federal holiday. The Commissioner is hereby authorized to charge our Deposit Account No. 12-1781 for any fees connected with this communication.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'William D. Jackson', written in a cursive style.

William D. Jackson
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Date: January 22, 2002

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Attachment t Response (Amendment) t September 20, 2001 Office Acti n:

1. A process for cracking an olefin-rich hydrocarbon feedstock which is selective towards propylene in the effluent, the process comprising contacting a hydrocarbon feedstock containing olefins having a first composition of at least one olefinic component with [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to 30h⁻¹, the feedstock and the effluent having substantially the same olefinic content by weight therein, and the effluent having a higher propylene content than the feedstock.

20. A process for the cracking of olefins in a hydrocarbon feedstock containing at least one diene and at least one olefin, the process comprising hydrogenating the at least one diene to form at least one olefin in the presence of a transition metal-based hydrogenation catalyst at an inlet temperature of from 40 to 200°C and an absolute pressure of from 5 to 50 bar with a hydrogen/diene molar ratio of at least [around] 1, and catalytically cracking the olefins in the presence of [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 at an inlet temperature of from 500 to 600°C and an olefin partial pressure of from 0.1 to 2 bar to produce at least one olefin having a different olefin distribution with respect to average carbon number than the at least one olefin in the feedstock.

27. A process for the catalyst cracking of olefins to lighter olefins, the process comprising contacting a first hydrocarbon stream comprising light cracked naphtha and a second hydrocarbon stream comprising C₄ olefins with [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 at a temperature of from 500 to 600°C and at an absolute pressure of from 0.5 to 2 bars to produce an effluent stream rich in lighter olefins.

30. A process for cracking an olefin-rich hydrocarbon feedstock which is selective towards propylene in the effluent, the process comprising contacting a hydrocarbon feedstock containing olefins having a first composition of at least one olefinic component with [a] an MFI crystalline silicate catalyst selected from the group consisting of ZSM-5 and silicalite having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to 30h⁻¹, the feedstock and the effluent having substantially the same olefin content by weight therein, and the effluent having a higher propylene content than the feedstock.

34. A process for cracking an olefin-rich hydrocarbon feedstock which is selective towards propylene in the effluent, the process comprising contacting a hydrocarbon feedstock containing olefins having a first composition of at least one olefinic component with [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to 30h⁻¹, the feedstock and the effluent having substantially the same olefinic content by weight therein, and the effluent having a higher propylene content than the feedstock, wherein the feedstock comprises a light cracked naphtha.

35. A process for cracking an olefin-rich hydrocarbon feedstock which is selective towards propylene in the effluent, the process comprising contacting a hydrocarbon feedstock containing olefins having a first composition of at least one olefinic component with [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to 30h⁻¹, the feedstock and the effluent having substantially the same olefinic content by weight therein, and the effluent having a higher propylene content than the feedstock, wherein the feedstock is selected from the group consisting of a C₄ cut from a fluidised-bed catalytic cracking unit in a refinery, or a C₄ cut from a unit in a refinery for producing methyl tert-butyl ether and a C₄ cut from a steam-cracking unit.

36. A process for cracking an olefin-rich hydrocarbon feedstock which is selective towards propylene in the effluent, the process comprising contacting a hydrocarbon feedstock containing olefins having a first composition of at least one olefinic component with [a] an MFI crystalline silicate catalyst having a silicon/aluminum atomic ratio of from 180 to 1000 to produce an effluent having a second composition of at least one olefinic component, the feedstock contacting the catalyst at an inlet temperature of from 500 to 600°C and being passed over the catalyst at an LHSV of from 10 to 30h⁻¹, the feedstock and the effluent having substantially the same olefinic content by weight therein, and the effluent having a higher propylene content than the feedstock, wherein the feedstock is selected from the group consisting of a C₄ cut from a steam cracker and light cracked naphtha.